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IN THE CLAIMS

1-12. Cancelled

13. (Currently Amended) ~~The heterodyne laser interferometer as claimed in claim 10, further comprising:~~

A heterodyne laser interferometer, comprising:

a heterogeneous mode helium-neon laser light source for generating a light beam having two frequency components that are linearly polarized and perpendicular to one another;

an optical interferometer coupled to receive a first portion of the light beam from the laser light source and to generate a measured signal therefrom, said first portion including portions of the two frequency components;

a frequency converter coupled to receive the measured signal and a reference signal that is based on the remaining portion of the light beam, said remaining portion including portions of the two frequency components, said frequency converter configured to adjust the frequencies of the measured signal and the reference signal without adjusting their relative phase; and

a superheterodyne phase measurer coupled to the frequency converter for measuring a phase of the frequency converted measured signal and the frequency converted reference signal;

a signal splitter for splitting the measured electrical signal into first and second split signals;

a first mixer for multiplying the first split signal by a local oscillation signal having a frequency $f_b + f$ to produce a third signal;

a second mixer for multiplying the second split signal by a local oscillation signal having a frequency $f_b - f$ to produce a fourth signal;

a first filter for eliminating radio frequency components from the third signal to generate a fifth signal having a frequency $f + \Delta f$;

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a second filter for eliminating radio frequency components from the fourth signal to generate a sixth signal having a frequency $f - \Delta f$; and

wherein the phase measurer is configured to use the fifth signal when a Doppler frequency is positive and the sixth signal when the Doppler frequency is negative.

14. (Currently Amended) A heterodyne laser interferometer, comprising:

a heterogeneous mode helium-neon laser light source for generating a light beam having two frequency components that are linearly polarized and perpendicular to one another;

an optical interferometer coupled to receive a first portion of the light beam from the laser light source and to generate a measured signal therefrom, said first portion including portions of the two frequency components;

a frequency converter coupled to receive the measured signal and a reference signal that is based on the remaining portion of the light beam, said remaining portion including portions of the two frequency components, said frequency converter configured to adjust the frequencies of the measured signal and the reference signal without adjusting their relative phase; and

a superheterodyne phase measurer coupled to the frequency converter for measuring a phase of the frequency converted measured signal and the frequency converted reference signal;

a polarizer coupled to receive said remaining portion of the light beam, the polarizer having a polarization axis that is titled at 45° relative to the two frequency components of the light beam;

a photodetector coupled to receive light from the polarizer and in response thereto generate an electrical reference signal;

wherein the optical interferometer comprises:

a polarization splitter for splitting the light beam into a first of the two frequency components and a second of the two frequency components;

a fixed reflecting mirror for receiving the first frequency component;

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a movable reflecting mirror for receiving the second frequency component;

a polarization combiner for combining the first frequency component reflected by the fixed reflecting mirror with the second frequency component reflected by the movable reflecting mirror, said polarization combiner having a polarization axis that is titled at 45° relative to the two frequency components of the light beam; and

a photodetector for receiving combined light from the polarization combiner and in response generating the measured signal as an electrical signal; wherein the frequency converter comprises:

a local oscillator for generating a local signal approximately equal to a beat frequency of the reference signal;

a signal splitter for splitting the local signal into first and second local signals;

first and second mixers for multiplying the reference signal with the first and second local signals respectively to provide first and second output signals, respectively;

a first filter for eliminating from the first output signal a signal corresponding to the sum of the reference signal and the first local signal;

a second filter for eliminating from the second output signal a signal corresponding to the sum of the reference signal and the second local signal, whereby the phase measurer receives third and fourth signals passing through the first and second filters, respectively.